AML Project Description

Date: 02/05/02

Project Name: Formosa

Mine Name: Formosa/Silver Butte

AMLIS #: OR105800002

State Office Contact: John Kalvels

Field Office Contact: Eric Heenan (541) 464-3308

HUC #/Subbasin: 17100302

Specific Watershed: South Umpqua

Location: Oregon T. 31 S., R. 6 W., Sec. 23, SW
UTM E 468800 UTM N 4744800

Land Ownership: BLM & Non BLM

Project Selection/Priority Criteria: Water and soil sampling at the Formosa site and adjacent streams indicates that the AML site causes, or significantly contributes to the following:

1. Exceedences of State water quality standards for zinc, cadmium, and copper within the Middle Creek and South Fork of Middle Creek.

2. Evidence of violation of State regulations for the designated beneficial use of State waters.

3. A threat to public health.

4. A threat to the environment.

The Middle Creek watershed, including its South Fork, is designated as a Tier 1 Key Watershed under the Northwest Forest Plan and has a high priority for watershed restoration. Fish surveys conducted by the BLM during 1984 documented the presence of coho salmon and steelhead throughout the watershed. None have been observed in upper Middle Creek for several years, and are not expected to, until water quality improves and macro invertebrate populations recover.

General Statement: The site is located approximately 25 miles south of Roseburg, OR. The area consists of a recently abandoned underground copper mine located on both BLM and private land which was first mined in the 1930's. The total surface disturbance on BLM lands is less than 2 acres on this 76 acre site. Acid Rock Drainage (ARD) is known to flow from 2 adits (one of which is located on BLM managed land), a former mill site with tailings, and acidic waste rock dumps. This ARD has, and continues, to affect Middle Creek and South Fork Middle Creek for a total of approximately 18 miles of stream. Drainfields constructed to receive some of these flows have repeatedly malfunctioned. Groundwater may be affected. Monitoring wells have been installed but data to date is inconclusive. Almost all of the mine workings, both surface and sub-surface, including the mill site, were located either on or under private property. A variety of water quality data collected by USGS and others exists. In order to determine the nature and extent of the contamination and identify source areas to be targeted for removal actions, an intensified sampling and monitoring plan is underway as part of Remedial Investigation/Feasibility Study (RI/FS). This is necessary to characterize the various sources, and the approximate loading percentage from each source, of the contaminants to the stream system. The information will be utilized in developing remediation alternatives.

The Oregon Department of Environmental Quality (DEQ) and BLM are working cooperatively to investigate and cleanup the Formosa AML site. BLM has been conducting the sampling associated with completing the RI/FS. DEQ has taken the lead on implementing interim removal actions to address the AMD problems and stabilize the site. BLM will then conduct post-removal monitoring. DEQ and BLM are in the early stages of preparing and negotiating a Memorandum of Agreement (MOA) that will state each agency's roles and responsibilities for conducting long-term operations and maintenance activities.

Project objectives

1. Reduce the mobilization and transport of contaminants to levels which more fully support State designated aquatic life uses in Middle Creek and the South Fork of Middle Creek.
2. Prevent exceedences of state water quality standards for zinc, cadmium, and copper in Middle Creek and the South Fork of Middle Creek.
3. Reduce threats to the environment by reduction in downstream transport of toxics in surface waters and stream sediments.

Measures of project success

Initially, post-project aquatic life uses will be measured by restoration of macro invertebrate communities to levels comparable with pre-Formosa mine conditions, or nearby reference streams. Once the stream food web has recovered, it is expected that salmonid populations will return to those stream segments. It is also expected that stream substrates will be cleansed by high flows reducing sediment concentrations of zinc, copper, and cadmium. Sediment samples will be collected and compared to pre-project USGS data.

Remediation Phases

Phase I FY '99- Site Characterization
Phase I of this plan, site characterization, began in fiscal year 1999. The characterization included stream sediment sampling, macro-invertebrate sampling , total metals loading analysis, on-site soils sampling and analysis, and the installation of ground water monitoring wells. The Oregon Department of Environmental Quality (ODEQ) has been a cooperator in this study of the streams in the vicinity of the Formosa site and conducted Total Dissolved Metals analysis of the samples.

A initial site assessment has been conducted utilizing federal 1010 AML remediation funds received FY 1999. The completed assessment consolidated data resulting from the stream characterization study, baseline and monitoring data collected by Formosa Exploration Inc., and existing monitoring data collected by the Oregon Department of Geology and Minerals Industries (DOGAMI) and BLM into a comprehensive analysis and report.

Phase II FY '00- Engineering Evaluation/Cost Analysis
The DEQ completed an Engineering Evaluation/Cost Analysis which incorporated BLM's investigations. An Interim Removal Action Measure was designed utilizing the results of these investigations and topographic mapping of the site conducted by the BLM.

The interim action was intended to address the threats on a short-term basis until a more thorough evaluation could be completed and a final remedy for the site designed and constructed.

DEQ and BLM completed the final plans to implement interim measures that focus on acid mine drainage from the two adits (openings into the mine workings) and the encapsulation mound. The interim removal action consisted of:

§ Capping the encapsulation mound to prevent infiltration of rainwater into the covered tailings which may be creating the acid mine drainage into South Fork Middle Creek.

§ Treating acid mine drainage from the Formosa and Silver Butte adits by routing the drainage through a limestone channel, into settling tanks, and to anaerobic treatment ponds to remove the majority of the metals.

Due to a problem with obtaining access to a parcel of privately owned timber land, DEQ needed to revise the interim actions. Under the revisions, only measures that could be implemented prior to the start of the winter rain season on BLM and/or Formosa Explorations property were implemented in the year 2000 (See Phase III for specifics).

Monitoring the results of the interim actions is essential towards developing a long term solution and remediation plan for the site.

Phase III- FY '01-'05 Interim Remedial Action-
Implementation of the Interim Remedial Action Measure began in FY'00 with the installation of limestone channels and settling tanks to capture and pre-treat the effluent from the adits and prevent it from flowing directly into Middle Creek. Results from monitoring the effectiveness of these measures were inconclusive because run-off and high stream flows did not occur during the abnormally dry winter of 2000/2001.

Alternative locations for siting of constructed wetlands as a main component of the passive treatment facility have been explored because of the inability to acquire the privately owned land originally investigated. A general lack of flat suitable ground existing in the vicinity of the site forced the consideration of locations a couple miles downstream. The increased cost of constructing and maintaining a facility to transport the effluent to the alternative locations, the increased risk of a failure of the facility resulting in additional contaminated ground, along with the lack of conclusive monitoring information from the previous winter resulted in a need to revisit the EE/CA, the remediation alternatives, and ultimately, a revision to the Action Memorandum under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA).

Monitoring of the initial actions over the winter of 2001/2002 will provide valuable information on the effectiveness of the treatment methods and allow DEQ and BLM to design additional interim actions to address the sources of contamination and determine a final cleanup for the site.

Additionally, remediation of the site has been divided into two separate Removal Actions: contaminant sources to Middle Creek as the focus of one action, and contaminant sources to the South Fork Middle Creek as the other.

The South Fork remediation strategy incorporates surface water diversions and re-capping of the encapsulation mound, theorizing that surface water comes into contact with sulfide materials placed there and flows out through seeps as the main source of contaminates to the stream. Installation of monitoring wells in this location and monitoring of the wells and stream during the winter of 2001/2002 should provide valuable information regarding effectiveness of this strategy as well as aiding in characterizing potential ground water interactions and contributions to the impaired water quality of the South Fork Middle Creek.

Phase IV- FY '05- FY '10 Post Removal Action Monitoring

This phase includes post-remediation monitoring. The monitoring will include continued macro-invertebrate and total dissolved metals sampling. Post-remediation site monitoring is expected to be conducted for five years. The monitoring will determine the success of remediation efforts at the site, and will focus on the metals levels in surface waters and sediments, and in documenting the number of intolerant taxa present in the stream systems. The remediation efforts will be considered a success upon achieving a level of these taxa similar to that which is documented to have existed prior to Formosa's activities at the site.

Maps/Photos/Gantt Chart: